THREE NEW SPECIES OF PHEBALIUM Vent. SECT. ERIOSTEMOIDES Endl. (RUTACEAE) FROM SOUTH-EASTERN AUSTRALIA

by

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ABSTRACT

Walsh, Neville G. & Albrecht, David E. Three new species of *Phebalium* Vent. sect. *Eriostemoides* Endl. (Rutaceae) from south-eastern Australia. *Muelleria* 6(6): 399-409 (1988). — *Phebalium frondosum* and *P. wilsonii,* both from Victoria, and *P. rhytidophyllum* from New South Wales, are described as new species. The habitat, distribution, relationships and conservation status of each are discussed and illustrations provided.

TAXONOMY

Phebalium wilsonii N. G. Walsh & D. E. Albrecht, sp. nov.

Frutex vel arbor parva ad 10 m altus. *Ramuli* teres tuberculati lepidoti. *Folia* anguste elliptica vel lanceolata 30-80 mm longa, 5-15 mm lata, apice obtusa vel acuta, supra nitida, infra dense argenteo-lepidota. *Flores* 2-9 in cymis axillaribus. *Sepala* lepidota. *Petala* extra lepidota. *Filamenta* prope bases sparsim stellato-pilosa. *Ovarium* lepidotum. *Stylus* prope basem sparsim stellato-pilosus.

Shrub or small tree to 10 m high. *Branchlets* terete, densely lepidote, glandular-verrucose. *Leaves* alternate. *Petiole* 1-7 mm long. *Lamina* narrowly elliptic to lanceolate, mostly 30-80 mm long, 5-15 mm wide, chartaceous; apex obtuse to acute; margin plane to slightly recurved; upper surface smooth and glossy, glabrous except for scattered scales along the slightly impressed midrib, becoming slightly wrinkled and the glands raised when dry; lower surface densely silvery-lepidote, the midvein apparent to the apex, the lateral nerves not visible. *Inflorescences* axillary, each a 2- to 9-flowered cyme up to ½ the length of the subtending leaf, sometimes forming a slender, leafy, apparent panicle on a short, indeterminate, lateral branchlet. *Peduncle* mostly 5-12 mm long. *Pedicel* 2-8 mm long, densely lepidote. *Floral bracts* 1-3, elliptic, 5-8 mm long, leaf-like; margins incurved. *Bracteoles* 0-2, minute, caducous. *Sepals* united at extreme base, triangular, 0.8-1.1 mm long, lepidote on outer surface. *Petals* elliptic, 3.5-5 mm long, white, lepidote on outer surface. *Stamens* equal to or slightly shorter than petals; filaments slightly flattened, tapering distally, 3-3.5 mm long, bearing marginal stellate trichomes near the base; anthers broadly elliptic in outline, 0.8-1 mm long. *Disc* c. 0.3 mm long, glabrous, slightly narrower than ovary. *Ovary* more or less hemispherical, c. 1 mm long, silvery-lepidote. *Style* slender, terete, c. 2 mm long, glabrous or sparsely stellate-hairy near the base. *Cocci* slightly spreading, obliquely ovoid, somewhat flattened, pointed at the apex, c. 4 mm long, becoming glabrous or retaining a few scales at maturity. *Seed* flattened-ellipsoid to sub-reniform, probably c. 3 mm long but no mature material seen. Figs 1, 2.

TYPE COLLECTION:

Victoria — Central Highlands, M.M.B.W. O'Shannessy Catchment. At crossing of Deep Ck by track #5; 7.5 km due south from Mt Grant, alt. 720 m, 37° 36′ 20″ S., 145° 48′ 50″ E., 6.xi.1985, *N. G. Walsh 1494* (Holotype: MEL 1540265. Isotypes: AD, BRI, CBG, HO, K, MEL 687868, NSW, PERTH).

SELECTED SPECIMENS EXAMINED:

Victoria — Woods Point, Goulbourne [sic] R., 1892, *W. F. Gates* (MEL 4350). Type locality (see above): 27.iv.1979, *N. G. Walsh s.n.* (MEL 596008); 22.x.1980, *N. G. Walsh 561* (MEL 596143) and 22.i.1987, *N. G. Walsh 1695* (MEL 1553276).

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Fig. 1. *Phebalium wilsonii*. a — Flowering branch, x 2/3. b — Flower, x 4. c — Fruit with three near-mature cocci and two aborted cocci, x 4.

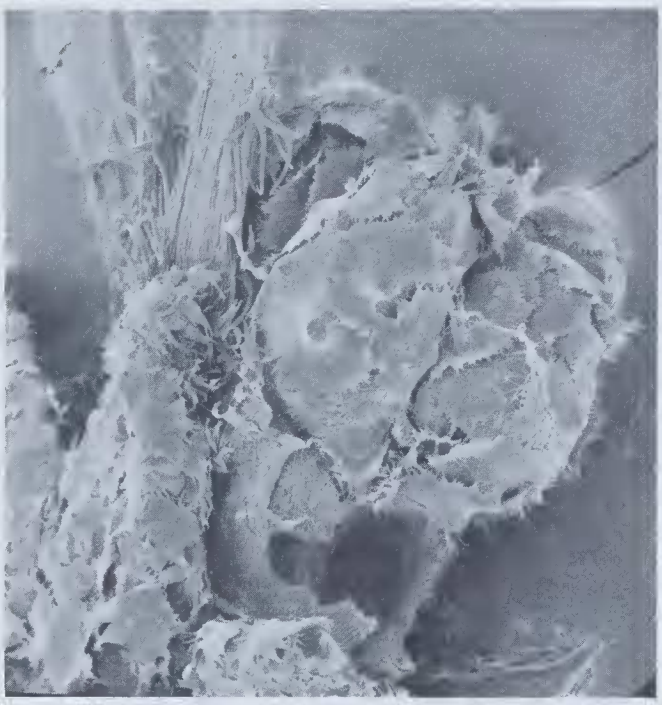

Fig. 2. *Phebalium wilsonii*. SEM microphotograph showing lepidote ovary, ruptured disc (lower centre), lepidote sepal (lower to centre left) and bases of staminal filaments with stellate trichomes (centre to upper left), x 48.

DISTRIBUTION (Fig. 7) AND CONSERVATION STATUS:

Known with certainty only from the type locality. The collection by Gates from Woods Point, c. 35 km east of the type locality, indicates that the species may be more widespread but the lack of recent collections from Woods Point and the alteration of the area near there since 1892 by wildfire, settlement and gold prospecting, suggests that *P. wilsonii* may no longer occur at that locality. About 500 plants (including numerous seedlings) were observed at the type locality. The species conservation status is assessed at 2R (Briggs & Leigh, in press), that is, the species is known from a geographic range of less than 100 km and is rare. The species is not known from a conservation reserve although current catchment policy of the Melbourne and Metropolitan Board of Works ensures the species' survival at least in the short term.

HABITAT:

Montane, (alt. 720 m), occurring within *Eucalyptus regnans* tall open forest merging to *Nothofagus cunninghamii* cool temperate rainforest. Soils are deep mountain loams derived from granite. *P. wilsonii* appears to be an ecotonal species and probably regenerates following disturbance, as evidenced by its successful establishment along track margins in the type area.

DISCUSSION:

P. wilsonii is unique in the section *Eriostemoides* in possessing the following combination of characters: very glossy, narrowly elliptic or lanceolate leaves (30-80 mm long), tuberculate branchlets, and lepidote ovary and petals. It bears a close superficial similarity to *P. squameum* (Labill.) Engl. subsp. *squameum,* a shrub or small tree from the Otway Ranges in Victoria, from Tasmania and from near-coastal forests of central New South Wales to southern Queensland. However *P.*

squameum subsp. *squameum* has non-tuberculate branchlets, and glabrous petals and ovary.

This species is the taxon identified by P. G. Wilson in his revision of *Phebalium* (Wilson, 1970) as *Phebalium* aff. *squameum,* but not formally named therein.

The species is named after Mr Paul G. Wilson in respect of his work on the Australian flora (particularly, in this case, the Rutaceae) and in recognition of his English description of the species, on which the present account is largely based.

Phebalium rhytidophyllum D. E. Albrecht & N. G. Walsh, sp. nov.

Frutex ad 3 m altus. *Ramuli* angulati glandulo-verrucosi lepidoti. *Folia* obovata, 3-12 mm longa, 2.5-9.5 mm lata, apice obcordata, supra glanduloso-punctata, nitida, rugata ubi siccata, infra dense lepidota. *Flores* axillares cymis unifloris raro bifloris vel trifloris. *Sepala* glabra raro sparsim lepidota. *Petala* glabra. *Filamenta* glabra. *Ovarium* glabrum.

Rather densely foliose shrub to 3 m high. *Bark* ultimately grey-brown, smooth. *Branchlets* angular, densely coppery-lepidote, sparsely to densely glandular-verrucose, becoming glabrous and terete with age. *Leaves* alternate. *Petioles* 1-2 mm long. *Lamina* obovate, 3.0-12.0 mm long, 2.5-9.5 mm wide, coriaceous; apex obcordate, cleft to about ⅛ leaf length; margins plane to recurved; upper surface glabrous, glossy, glandular-punctate, becoming prominently wrinkled in dried material due to contraction of mesophyll tissue between glands; lower surface densely silvery- to pale coppery-lepidote when young, becoming silvery-lepidote when mature, the midvein scarcely apparent and the lateral veins not visible. *Inflorescences* axillary, each a 1 (rarely to 3)-flowered cyme; peduncle and pedicel angular to flattened, coppery-lepidote, together 2-7 mm long in 1-flowered inflorescences or peduncle 2-6 mm long and pedicel 1-4 mm long in 2- or 3-flowered cymes. *Floral bracts* 1-4, oblong, 1-2 mm long, copper-lepidote on exterior surface, strongly incurved. *Bracteoles* 0-2, smaller and narrower than the bracts, lepidote, concave. *Sepals* slightly fused at base, deltoid, 0.5-1.2 mm long, glabrous or rarely with a few scales toward the base on the outer surface, white, glandular-punctate; apex often inflexed. *Petals* elliptic, 3.5-4.5 mm long, white, glandular-punctate, glabrous. *Stamens* virtually equal in length to petals; filaments slightly flattened, tapering distally, glabrous, 3-3.5 mm long; anthers ovoid to suborbicular, slightly retuse, 0.7-0.9 mm long. *Disc* 0.2-0.4 mm long, equal in width to ovary. *Ovary* hemispherical to broadly conical, c. 1 mm long, glabrous, glandular. *Style* slender, terete, c. 2.5 mm long, glabrous. *Cocci* slightly spreading at maturity, c. 3-3.2 mm long, quadrate, minutely apiculate on the outer angle, glabrous, glandular-verrucose, reticulate. *Seed* oblong to sub-reniform, c. 1.8-2 mm long, very dark brown to black. Figs 3, 4.

Type Collection:

New South Wales — Southern tablelands/south coast, Rocky outcrop 1.0 km NW. of Wog Wog Mountain trig, Nalbaugh National Park, 37° 05′ 15″ S., 149° 25′ 15″ E., 18.xii.1985, *D. E. Albrecht 2333.* (Holotype: MEL 1553279. Isotypes: K, NSW, PERTH).

Selected Specimens Examined:

New South Wales — White Rock Plateau, between Mt Wog Wog and White Rocks, 37° 05′ 00″ S., 149° 24′ 30″ E., 26.iii.1985, *D. E. Albrecht 1658* (MEL 1553280). 1.0 km NW. of Wog Wog Mountain trig, 37° 05′ 15″ S., 149° 25′ 15″ E., 18.xii.1985, *H. Thompson 718* (CBG 8506152). 2.3 km NW. of Wog Wog Mountain trig, 37° 04′ 50″ S., 149° 24′ 40″ E., 22.ii.1987, *D. E. Albrecht 3064 & P. Gilmour* (MEL 1553281). 2.9 km NW. of Wog Wog Mountain trig, 37° 04′ 40″ S., 149° 24′ 30″ E., 22.ii.1987, *D. E. Albrecht 3065 & P. Gilmour* (MEL 1553282).

Distribution (Fig. 7) and Conservation Status:

Known only from four populations on the plateau between Wog Wog and White Rock Mountains, approximately 25 km south-east of Bombala in far south-eastern New South Wales. All populations are situated within Nalbaugh National

Park. However, the populations are small and the total number of individuals known would not exceed 200. The conservation status is assessed at 2VCit (Briggs & Leigh, in press), that is, the species is known from a geographical range of less than 100 km, it is vulnerable due to the low total known population, and the total population is contained within a biological reserve. The plateau supports highly

Fig. 3. *Phebalium rhytidophyllum*. a — Flowering branch, x 2/3. b — Flower, x 4. c — Fruit, x 4.

Fig. 4. *Phebalium rhytidophyllum*. SEM microphotograph showing glabrous ovary (right of centre), glabrous sepals (centre) and glabrous bases of staminal filaments (centre to right), x 35.

disjunct populations of several rare species, e.g. *Acacia costiniana* Tindale and *Boronia deanei* Maiden & Betche, and it is possible that disjunct populations of *P. rhytidophyllum* will also be discovered further north in suitable environments.

HABITAT:

The plateau experiences a cool, moist climate with frequent mists and occasional snowfalls during winter. The predominant rock type is granite which outcrops in a number of localities. Where there is sufficient soil development to support open forest, *P. rhytidophyllum* grows under a canopy dominated by *Eucalyptus fraxinoides* or *E. obliqua*. More commonly however, it occurs in mixed species shrublands with *Leptospermum scoparium, Epacris robusta, Leucopogon gelidus* and *Hakea dactyloides* in sheltered aspects on large rock expanses. *P. rhytidophyllum* also extends to a limited degree into drier, more exposed sites on the northern edge of the plateau where *Eucalyptus sieberi, Kunzea ambigua* and *Hakea dactyloides* are common species. Its known altitudinal range is 1025-1070 metres.

DISCUSSION:

P. rhytidophyllum is unique in the section *Eriostemoides* in possessing the following combination of characters: the leaves are obovate, relatively small (to 12 mm long), have distinctive obcordate apices and become strongly wrinkled above when dry. The bracts are short (to 2 mm long) and narrow, the inflorescence is generally a 1- (rarely 2- or 3-) flowered cyme and the ovary is glabrous.

P. rhytidophyllum appears to be most closely related to *P. squameum,* which was divided into three subspecies by Wilson (1970). Of the three infraspecific taxa, subsp. *coriaceum* and subsp. *retusum* (between which the distinctions are not always clear) are closest to *P. rhytidophyllum* but are distinguished from that species in having ovate, elliptic or oblong leaves (mostly > 15 mm long) with obtuse to retuse

apices, longer (> 2 mm long) and broader bracts and an inflorescence which is generally a 2- to 6- (rarely 1-) flowered cyme.

P. frondosum (described herein) bears a superficial resemblance to *P. rhytidophyllum* but it differs clearly from that species in several characteristics including the thinner, ovate leaves with obtuse or slightly emarginate apices, the non glandular-verrucose stems, the larger (> 2 mm long) bracts and the ovary which is endowed with stellate trichomes.

The specific epithet refers to the very prominent wrinkling of the adaxial leaf surface which is conspicuous in dried material.

Phebalium frondosum N. G. Walsh & D. E. Albrecht, sp. nov.

Frutex ad 7 m altus. *Ramuli* valde angulati, lepidoti. *Folia* complanata, ovata, 8-23 mm longa, 6-15 mm lata, apice obtusa vel emarginata, infra dense argenteo-lepidota. *Flores* axillares cymis unifloris raro bifloris vel trifloris. *Sepala* dense lepidota. *Petala* glabra. *Filamenta* prope bases stellato-pilosa. *Ovarium* prope basim lepidotum, ad et prope summum stellato-pilosum.

Shrub to c. 7 m high, conical, densely foliose. *Branches* and branchlets produced almost horizontally or slightly down-arched. *Branchlets* strongly angled and densely lepidote. *Leaves* spreading horizontally from branches. *Petiole* 2-5 mm long. *Lamina* ovate, mostly 8-23 mm long, 6-15 mm wide, chartaceous; apex obtuse or slightly emarginate; margin plane, becoming recurved on drying; upper surface glabrous, glandular, the glands becoming prominently raised and the lamina sometimes obscurely wrinkled on drying; lower surface densely silvery-lepidote, the midvein barely apparent and lateral veins not visible. *Inflorescences* axillary, each a 1 (rarely to 3)-flowered cyme; peduncle and pedicel decurved, strongly angular, lepidote, together 6-12 mm long in 1-flowered inflorescences, or peduncle 4-9 mm long and pedicel 1-4 mm long in 2- or 3-flowered cymes. *Floral bracts* oblong to obovate, 2-5 mm long, strongly incurved and lepidote on abaxial surface. *Bracteoles* 0-2, subopposite, minute, caducous, inserted immediately below the calyx. *Sepals* shortly united near base, triangular, 1.5-2.5 mm long, closely lepidote on outer surface. *Petals* elliptic, 4-6 mm long, glabrous, sparsely glandular about the centre. *Stamens* slightly shorter than petals; filaments slightly flattened, tapering distally, 3.5-4.5 mm long, bearing marginal trichomes near the base; anthers broadly elliptic, 0.8-0.9 mm long. *Disc* c. 0.7 mm long, equal in width to ovary. *Ovary* hemispherical, c. 1 mm long, densely covered with long-fringed scales near the base grading to tufted stellate trichomes toward and on the apex. *Style* slender, terete, c. 3 mm long, glabrous. *Cocci* slightly spreading at maturity, obliquely obovoid, slightly flattened, c. 4 mm long, bluntly pointed at outer angle, becoming glabrous or retaining a few trichomes within the dorsal groove, glandular, pustulose. *Seed* oblong, slightly keeled dorsally, c. 3 mm long, black. Figs 5, 6.

Type Collection:

Victoria — Carpark below summit of Mt Elizabeth no. 2, Mt Elizabeth State Forest, 37° 29′ 40″ S., 147° 55′ 55″ E., alt. 860 m, 14.x.1986, *D. E. Albrecht 2875* (Holotype: MEL 1553277. Isotypes: CBG, K, NSW).

Selected Specimens Examined:

Victoria — All from type locality: 8.ii.1964, *L. Banfield s.n.* (MEL 502291); 16.xi.1968, *J. H. Willis s.n.* (MEL 502291); 28.ii.1971, *A. C. Beauglehole 37128* (MEL 610751) and 26.i.1987, *N. G. Walsh 1697* (MEL 1553278).

Distribution (Fig. 7) and Conservation Status:

Known only from the summit area and upper southern slopes of Mt Elizabeth and probably endemic there as it has not been located in surrounding areas in several botanical studies (e.g. Forbes et al., 1981). The Mt Elizabeth summit area comprises a unique combination of altitude, geology and topography (McRae-

Fig. 5. *Phebalium frondosum*. a — Flowering branch, x 2/3. b — Flower, x 4. c — Fruit, x 4.

Fig. 6. *Phebalium frondosum*. SEM microphotograph showing ovary covered by fringed scales and stellate trichomes (centre), lepidote sepals (lower) and bases of staminal filaments with stellate trichomes, x 21.

Williams et al., 1981) and several rare or restricted species occur thereon, e.g. *Hibbertia hermanniifolia, Hovea* sp. aff. *purpurea, Prostanthera walteri* and *Tetratheca subaphylla*. The conservation status of *P. frondosum* is assessed as 2RCa (Briggs & Leigh, in press), that is, the species has a known geographic range of less than 100 km, is rare and is represented in a reserve where reservation is considered to be adequate to ensure the species' survival.

HABITAT:

Montane (alt. c. 820-940 m), occurring in *Eucalyptus obliqua, E. baxteri, E. sieberi* tall open forest below the summit and in mixed species shrubland dominated by *Kunzea ericoides, Leptospermum brevipes* and *Callistemon pallidus* on and near the rocky summit. Soils are loamy and shallow below the summit or skeletal at the summit, derived primarily from granodiorite or rhyolite parent material.

DISCUSSION:

This species is unique in the section *Eriostemoides* in possessing stellate trichomes on the ovary. The pendent, single-flowered cymes and the branching habit of the plant are also distinctive features. In addition, the odour from crushed leaves of *P. frondosum* is markedly dissimilar from other members of the section *Eriostemoides,* suggesting phytochemical analysis of the section may yield valuable comparative information.

Material of this species, first collected in 1964, was apparently not seen by P. G. Wilson prior to publication of his revision of *Phebalium* (Wilson, 1970). It was later incorrectly ascribed by authors (e.g. Willis, 1973; Costermans, 1981) to *Phebalium squameum* (Labill.) Engl. subsp. *coriaceum* P. G. Wilson, a montane to subalpine shrub barely 1.5 metres high and confined to only two localities, both

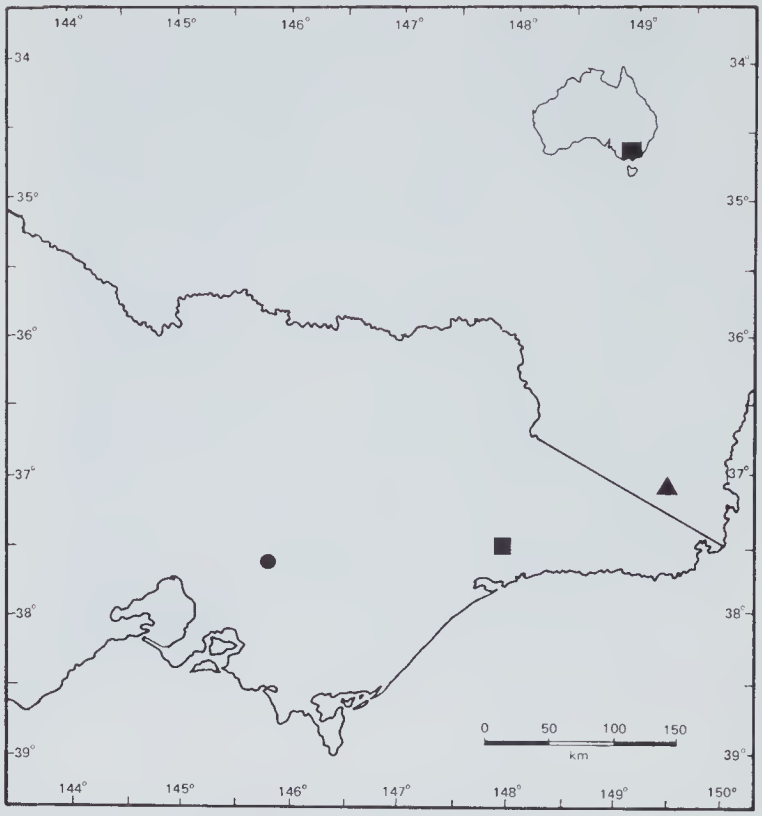

Fig. 7. Distribution of *P. wilsonii* — ●, *P. rhytidophyllum* — ▲ and *P. frondosum* — ■.

in eastern Victoria (see discussion under *P. rhytidophyllum* giving other characteristics of *P. squameum* subsp. *coriaceum*).

The specific epithet refers to the leafy habit of the plant and, in the common usage of "frond", alludes to the attractive, layered, frond-like appearance of the branches.

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